



Four-Year PhD Programme in Biophysics

Probing Nanostructure and Forces of Biomolecules using Atomic Force Microscopy

Supervisors: Dr Luning Liu (Institute of Integrative Biology), Dr David Martin and Dr Steve Barrett (Department of Physics)



In recent years, atomic force microscopy (AFM) has matured as a unique tool in bioscience research. AFM has shown powerful capabilities in imaging biomolecules with nanometre resolution under physiological conditions, monitoring at the picoNewton level the forces that drive biological processes, and exploring the structures and mechanical properties of sub-cellular organelles, entire cells and tissues.

The aim of this project is to utilise AFM and image analysis techniques to tackle some key questions in biophysics, including biological energy conversion processes, protein self-assembly, molecule structural and functional integrity. Understanding the molecular basis of protein assembly and biomembrane organisation is vital for the future development of bioenergy production, food security, health and disease diagnosis. The specific topics are:

- Photosynthetic membrane organisation, electronic properties and dynamics
- Conformational dynamics of membrane channel proteins
- Encapsulation of viruses and mechanism of virus-infection diseases
- Material contrast in real and artificial tissues

The PhD student will work in a multidisciplinary team across biology, physics, chemistry and nanotechnology, and will obtain extensive training in biochemistry, cell biology and biophysics. Training in all aspects of the project will be provided with access to state-of-the-art infrastructure (AFM, STM, SNOM, electron microscopy and spectroscopy, optical microscopy and spectroscopy, proteomics) in the Institute of Integrative Biology and the Department of Physics, and with collaborators in Europe and the US, which means that there will be good opportunity for career development.

Candidates should hold or expect to hold a first class (or high II.1) MPhys degree or equivalent, and have demonstrated an ability to work in a laboratory environment. Experience of project work in scanning probe microscopy and/or nanostructured systems would be an advantage. To apply for this studentship, please send a CV and a cover letter with contact information of three referees to Ms Linda March (biolres@liverpool.ac.uk). Review of application materials will begin on 1st April 2014 and continue until a suitable candidate is identified. For further details, please contact Dr Luning Liu (luning.liu@liverpool.ac.uk, website: http://pcwww.liv.ac.uk/~lnliu).

References: Trends Plant Sci. 2013, 18: 277-286; Appl. Phys. Lett. (2013) 102, 053701; PNAS 2012, 109: 11431-11436; PNAS 2011, 108: 9455-9459.